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As the demands on healthcare providers increase with the pervasiveness of technology in healthcare settings, burnout is a reality for 75% of general surgery residents. Residents spend over half of their workday interacting with technology, however, there exists a significant gap in literature at the intersection of tasks and technology in relation to burnout for general surgery residents. Understanding the contributing factors to burnout is essential, as there are downstream effects on physician wellness and efficiency, as well as patient safety and quality of care. Utilizing a sociotechnical framework allows for a comprehensive investigation into the factors contributing to burnout in the early stages of a surgeon's career. This study highlights the need for standardized practice when defining, identifying, and quantifying burnout in general surgery residents. With improved standardization, educators and administrators will be better equipped to facilitate a healthy physician workforce and improved quality of care for patients.

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EXPLORING THE SOCIOTECHNICAL FACTORS CONTRIBUTING TO BURNOUT AMONG GENERAL SURGERY RESIDENTS IN THE UNITED STATES: A SYSTEMATIC REVIEW

by
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1 INTRODUCTION

1.1 BACKGROUND

As the demands on healthcare providers continue to increase with the persistent influx of technology in healthcare settings, physician burnout is becoming a reality for one in three physicians (Jobe, 2020). Burnout is characterized as emotional, physical, and mental exhaustion as a result of prolonged stress (Patel, 2018). Physicians are expected to continue meet the expectations associated with increasing workloads and administrative duties with the same or less supportive resources. Further, much of the sociotechnical systems utilized by clinicians were sub optimally developed and implemented resulting in systems that are burdensome and unsafe.

As the presence of technology increases in healthcare settings across the United States, physicians are spending less facetime with patients and more time interacting with the healthcare IT systems (Vogenberg, 2018). This has significantly impacted the daily tasks and responsibilities of many healthcare providers in addition to larger the role that physicians have within healthcare settings. To accommodate these new changes, physicians are expanding the length of their workdays to provide consistent levels of care, while completing an increasing number of tasks. Many physicians report feeling as though their roles have transformed from patient facing caregivers to data entry clerks (Yeung, 2021). Unfortunately, despite the changes intended to make a more

communicative and cohesive healthcare system, the system remains incredibly fragmented, uncoordinated, and cumbersome to move through.

In an effort to support and maintain the healthcare workforce, it is imperative that administrators understand the interacting factors that contribute to physician burnout. Administrators and others leadership in healthcare settings have an opportunity to institute initiatives or policies to prevent burnout. However, to contribute meaningful change, administrators first need to better understand the contributing factors to burnout in residents. With a better understanding of the contributing factors to burnout, administrators can make more informed decisions and provide the necessary policy changes and resources to properly support physician well-being. As technology continues to play a prominent role in the working lives of physicians, a sociotechnical approach provides an understanding of the integrated experiences between residents and the technology in which they consistently interact with. Not only will this allow administrators to mitigate known burnout inducing factors, but it will also provide opportunities to create data-driven solutions to alleviate the stress that causes burnout. Understanding the sociotechnical factors contributing to burnout is essential as there are downstream effects on effectiveness, efficiency, and satisfaction, as well as quality of care and patient safety.

As the rates of burnout continue to rapidly increase across the healthcare landscape, it is worthwhile to investigate the factors present at the beginning of a physician's practicing career (Nituica, 2021). In assessing all residency or training programs, general surgery,

neurology, and radiology are considered the top three specialties with the highest prevalence of burnout among residents (Low, 2019). Further, one recent study identified that 75% of general surgery residents are experiencing high to severe levels of burnout (Karimuddin, 2021). These recent trends in increasing prevalence for general surgery residents suggests a need for intervention and an opportunity to look deeper into the factors contributing to burnout in the early stages of a surgeon's career. With the identification of the early contributing factors, there is the opportunity for administrators and educators to impart strategic change. While facets of healthcare technology, such as resident hours, have been studied in relation to clinician burnout, exploring the relationship between the existing sociotechnical factors in healthcare settings and burnout in surgery residents could provide a deeper understanding of the contributing factors to burnout in the beginning years of a surgeon's career.

1.2 Motivation

While there has been a recent increase in focus within the literature in the factors contributing to burnout in the healthcare profession, there remains a lack of understanding around the factors associated with burnout in resident physicians in the United States. There is a general acceptance that burnout exists among clinicians, including general surgeons, but there is a lack in understanding in regard to how these factors affect clinicians in the early stages of their careers. Further, many studies focus on individual, isolated factors contributing or mitigating burnout in healthcare professionals (Bria, 2012). There is a need to explore the interactions of these factors to better

understand the encompassing environment that general surgeons work within. A noteworthy factor in this environment is the increasing presence of technology in healthcare settings. Understanding the impact of technology and the implications of the consistent interactions between technology and healthcare providers may offer insight that will allow for a more comprehensive understanding of the factors contributing towards and mitigating burnout.

1.3 Purpose

The purpose of this review is to identify the existing literature regarding the sociotechnical factors associated with burnout in U.S general surgery residents. The sociotechnical framework provides a unique lens to evaluate the relationship of several contributing factors to burnout simultaneously to recognize that burnout is a result of interacting experiences. Through a review of the existing literature, it became clear where future work could provide impactful contributions. In addition, this review also highlighted historical areas of focus and common conceptual associations.

1.4 Research Question

This study is a systematic review of all existing relevant literature. This review addresses the following research question:

> To date, what sociotechnical factors have been associated with burnout among general surgery residents in the United States in the existing literature?

2 Literature Review

2.1 Healthcare Landscape Overview

Within the last decade, the healthcare landscape has evolved at a rapid pace with the introduction of technology. The rapid advancement of technology has driven efficiency, innovation, and cost of care, while enabling unprecedented healthcare transformation. Physicians are able to communicate with other physicians and patients in a way that was previously unfathomable. Further, physicians can see their patients' medical records across time, services and care models in a way that was not possible before the electronic health record. Even within electronic health records, technological advancement has provided physicians with data supported decision making tools through the implementation of artificial intelligence. Additionally, patients are empowered to take an active role in their care. Not only do patients have electronic copies of their records, but they have communication channels to connect with their providers via messaging, email and even virtual care visits. While the advancement of technology has transformed the healthcare landscape, in many ways the rate of innovation has outpaced the ability of health systems, administrators and clinicians to integrate it meaningfully into operations and care delivery (Gardner, 2018).

2.2 Burnout Today

Burnout is characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment. Burnout can impact the quality-of-care patients receive, patient satisfaction and the overall safety of healthcare. Specifically, burnout is associated with poorer-quality healthcare and reduced safety for patients. As providers become exhausted, they withdraw emotional energy from work, leading to depersonalization and impact the patient-perception of quality of care (Maslach, 2016).

Physicians are burning out on a massive and unsustainable scale. According to one survey, 1 in 3 physicians had signs of clinician burnout, which raises the concern that physicians are not providing the best possible care to patients (Jobe, 2020). With the rise of administrative tasks, physicians are spending less facetime with their patients and more time inputting data and navigating different healthcare technology systems. Some evidence suggests that just 13 percent of a physician's day is spent with patients, which starkly contrasts the prior models of care where physicians spent the majority of their day caring for their patients (Jobe, 2020).

Physicians have a higher rate of depression, substance abuse, anxiety, and suicide in comparison to the general population and it is speculated that burnout may be the precursor to these health outcomes (Eckleberry-Hunt, 2009). Identifying where burnout begins and the specific factors that lead to cburnout might be key to understanding how to prevent burnout and ultimately, the negative individual health outcomes that can be associated.

2.3 Burnout in Residents

A longitudinal study of first-year residents noted that students began their residency programs with high levels of well-being but by the end of their first year, they experience decreased levels of well-being and high levels of depression and burnout (Eckleberry-Hunt, 2009). In looking across all residency or training programs, general surgery, neurology, and radiology are considered the top three specialties with the highest prevalence of burnout among residents (Low, 2019). Further, one recent study identified that 75% of general surgery residents are experiencing high to severe levels of burnout (Karimuddin, 2021). Another study identified 69% of general surgery residents were experiencing burnout. In this study, they specifically identified that the prevalence of depressive symptoms were two times more than in reported-age matched peers. Further, suicidal ideation was more than three times higher than reported in the general population and nearly two times higher than reported in practicing surgeons (Lebares, 2018). These recent trends in increasing prevalence of burnout among general surgery residents in addition to the associated outcomes such as increased suicidal ideation and depression highlight a need for further research to identify methods to reduce in burnout and mitigate the associated outcomes.

2.4 Implications of Burnout

Burnout is associated with several problems, not only for individual physicians, but also for their employer organizations, patients, and the healthcare system as a whole. Recent changes in healthcare delivery have also raised concerns that burnout may worsen if

increased patient care and administrative demands outpace the support and allocated resources for physicians. Physicians are being repeatedly asked to see more patients, with less time and staffing to constantly improve efficiency. However, this has resulted in physicians spending less time with patients and providing more directive care, rather than collaborative and patient-centered care. In addition to the loss of personalization in the care that physicians are providing, burnout has also been associated with cognitive impairments, including attention deficits, which can lead to errors that impact the safety and quality of the care that patients receive from physicians experiencing burnout (Maslach, 2016).

2.5 Prior Research

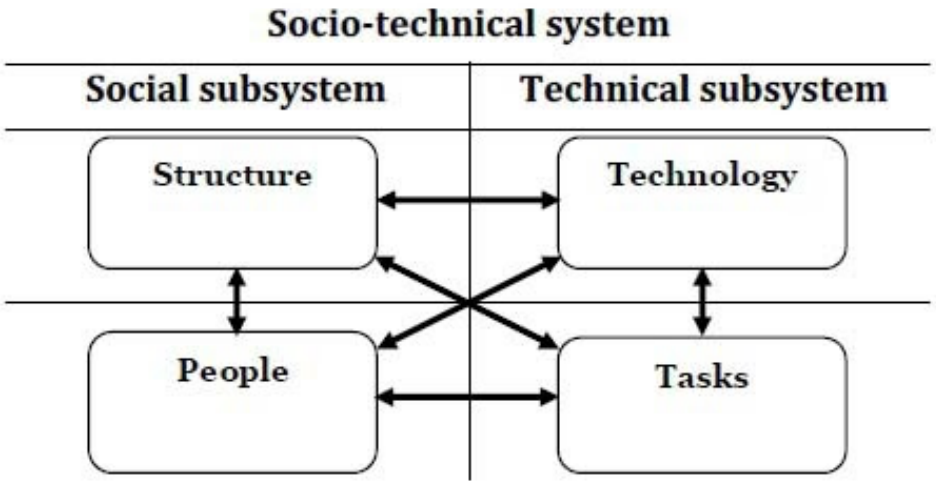
As provider burnout has continued to increase in recent years, prior research has worked to address the rising concern that physicians are being pushed to provide comprehensive care in addition to the newly instituted technological demands. The incessant and demanding regulatory documentation has been a consistent focal point when exploring why physicians are reporting such low job satisfaction (Epperson, 2018). In recognizing that the future of healthcare delivery is depending on resident success, it is imperative that burnout be addressed to sustain the workforce. (Epperson, 2018).

Despite the recognition of resident burnout as a persisting problem in healthcare and the knowledge that surgical residents experience among the highest prevalence of burnout, the comprehensive factors contributing to burnout remain unknown. Much of the existing

literature today focuses on an isolated or a coupled set of factors, such as work hours, depression, and social support in association to burnout. However, no identified studies looked at the comprehensive set of factors that contribute to burnout in general surgery residents. While identifying the relationships between a select few factors and burnout in general surgery has provided administrators, educators, and policy makers with insight to drive the creation of strategic initiatives to prevent an increase in burnout from these key factors, burnout remains a persisting issue plaguing general surgery residents. Exploring the relationships between known associated factors contributing to burnout could help assemble a clearer, more encompassing picture of the experiences and predictive factors that lead to burnout in general surgery residents.

2.6 Sociotechnical Factors

Figure 1: Sociotechnical Model Visualization



A sociotechnical approach encompasses the organizational, environmental, and human (socio) factors and information technology system factors (technical) as inter-related

parts of one system, each shaping and impacting the other. Specifically, sociotechnical focused research involves exploring the way technical and social dimensions change and shape each other over time (Cresswell,2014). For example, a sociotechnical perspective may “encompass investigating how technologies change social processes (e.g. the way care is delivered by, for example, introducing electronic health records), and how technologies themselves can change over time as a result of user/organizational requirements (e.g. ongoing customization to improve usability)” (Cresswell, 2014).

2.7 Healthcare Technology And Burnout

Healthcare information technologies (HIT), such as electronic medical records (EMR), computerized physician order entry (CPOE), and decision support systems (DSS), can enhance the safety, quality, and degree of patient focused care, while helping to reduce costs and improve efficiency. However, there have been mixed reviews on HIT's implementation and outcomes over the years. While there are benefits and positive outcomes associated with HIT, there is also research revealing many unanticipated and undesired consequences of implementation. Administrators and clinicians often blame these undesirable consequences and implementation failures on HIT. Although technical flaws do cause problems, many undesirable outcomes of HIT implementation are derived from sociotechnical interactions, such as physician workflows, workplace culture, social interactions, and technologies (Harrison, 2007).

Unfortunately, with the pace of healthcare technology innovation, technology has become as much of the problem as it is the solution. Healthcare technology is constantly evolving, updating and adapting. Consistently implementing and integrating into alignment with rapidly changing systems and practices is both exorbitantly costly and incredibly cumbersome (Jobe, 2020). Despite the positives impacts in improved communication, collaboration and access to information support decision-making, there have been significant impacts for physicians as they are reporting feeling overloaded with unnecessary information, experiencing bottlenecks, distraction and alarm fatigue. These unintended consequences can have devastating outcomes on patient outcomes, workflows, and a physician's mental state (Safran, 2008).

3 METHODS

This review was conducted in alignment with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). No previous systematic reviews on this specific topic were identified in the literature or within PROSPERO.

3.1 SEARCH STRATEGY

Embase, PubMed, Web of Science and Scopus were searched from database inception until November 11, 2020. The search strategy included combinations of 4 key conceptual terms: surgical, resident, factor, and burnout. Each concept comprised synonyms, contextual similarities and common associations to the respective term (Appendix 1).

3.2 ELIGIBILITY CRITERIA

Studies must meet all of the following criteria for inclusion. All studies needed to have the full text available and be written in English. All study and publication types were included, with the exception of any study considered a review article. Only studies from the United States were accepted in order to account for the uniqueness of the US healthcare and medical training systems. There were no further exclusions for study setting. Studies for inclusion must specifically focus on the factors related to burnout in general surgery residents. Studies focusing only on identifying the presence of burnout were not included.

Following the initial review, only studies focusing on general surgery residents were included. Studies that included other sub-specialties in addition to general surgery were considered eligible for inclusion. Residency year was not specified for inclusion. Studies must include residents, but were not excluded if they contained medical students, attending physicians or other healthcare professionals in addition to residents.

Table 1: Study Inclusion and Exclusion Criteria

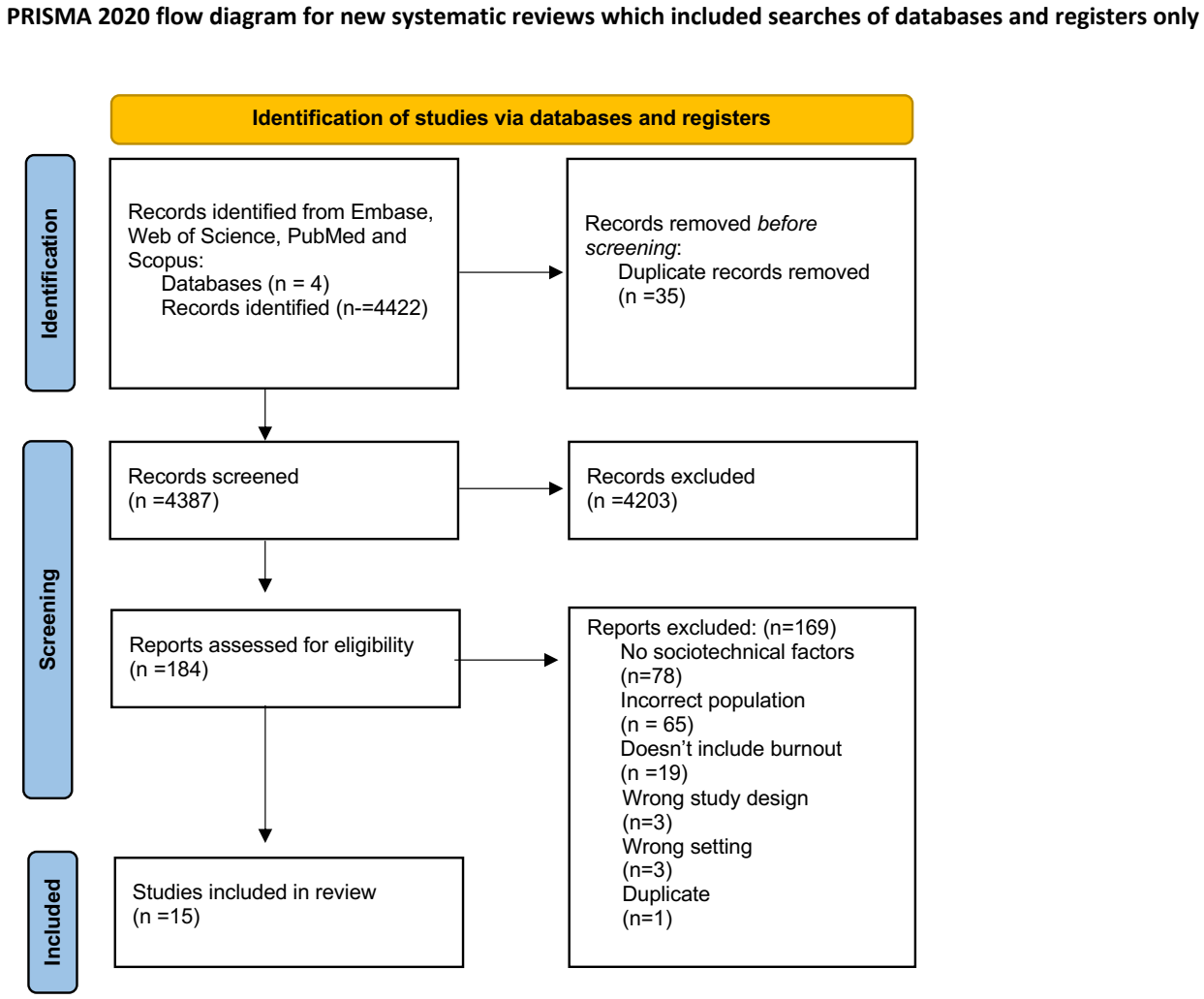
Date:	• Include studies published before November 11, 2020 • Exclude studies published after November 11, 2020
Geographic Location:	• Include all studies conducted in the U.S. • Exclude all studies conducted outside the U.S.
Language:	• Include all studies written in English • Exclude all studies not written in English
Availability:	• Include all studies with full-text versions available • Exclude all studies without full-text versions available
Publication Type:	• Include all studies not considered review studies • Exclude all studies considered review studies
Study Focus:	• Include all studies discussing the factors related to burnout in general surgery residents • Exclude all studies not discussing the factors related to burnout in general surgery residents

3.3 Data Selection

Studies were exported using Zotero and then imported into SciWheel. Studies were moved from SciWheel into EndNote to remove duplicates before being moved to Covidence for review. Once in Covidence, 4,387 titles and abstracts were screened for inclusion using two reviewers and a moderator to resolve any conflicts between the two reviewers. Of the 4,387 studies reviewed, 184 studies aligned with the pre-determined

inclusion criteria based solely on the title and abstract screening. A full text review was conducted for all 184 studies and 15 studies met all inclusion criteria.

Figure 2: Study Inclusion Flowchart

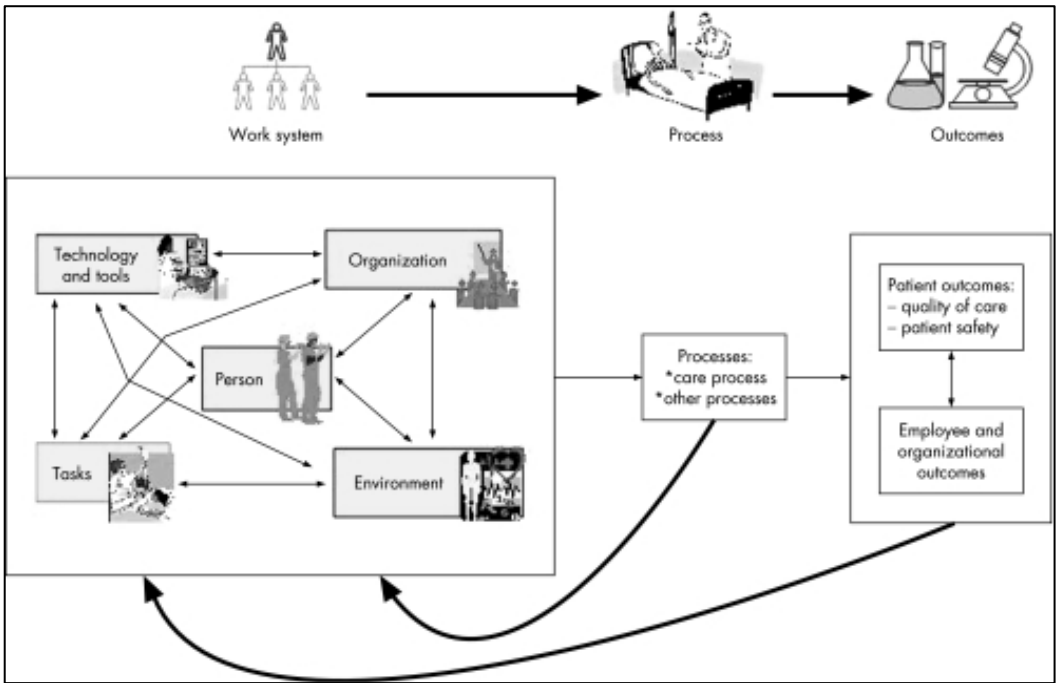


3.4 Data Extraction and Quality Assessment

Data was extracted from the 15 identified studies using the Systems Engineering Initiative for Patient Safety (SIEPS) framework (Image 2) for organization and

categorization of the factors related to burnout. The SIEPS framework provides a methodological approach to understanding the structures, processes and outcomes in health care and their relationships. Utilizing the SIEPS framework factors associated with burnout were categorized as either tasks, person, environment, organization, tor technology. Within these five categories, each factor was categorized as either mitigating or contributing to burnout based on the context and information provided by the study. General study information was collected, as well as AHRQ Quality Assessment Data.

Figure 3: SIEPS Framework



3.5 Data Analysis

Prior to data extraction, an Excel spreadsheet was used to organize information and prepare for data extraction. Data would be extracted under 8 categories: general study information, person, tasks, environment, organization, technology, and burnout.

Table 2: General Data Extraction Organizational Structure

General Study Information	SIEPS Framework					General Burnout Information
	Person	Task	Environment	Organization	Technology	

The general study information included items such as study title, authors, year of publication, participant demographics, study design, etc.

The components of the SIEPS framework were designed similarly. Previously identified factors were recorded within the respective tabs and new relevant factors were added as they became known during extraction. The layout was designed so that each factor could be recorded as either contributing to burnout or mitigating burnout depending on the way in which it was referenced in the study in question. If a factor was mentioned as being both contributing to and mitigating burnout then it was recorded as such.

The burnout specific information recorded for review was items such as if a study defined burnout, how burnout was defined, what tools were used to measure burnout, what tools were used in addition to burnout tools, the implications of burnout mentioned, etc.

Lastly, the Agency for Healthcare Research and Quality (AHRQ) Quality assessment scored studies on the directness, consistency, limitations, precision, and reporting bias observed in the study.

Table 3: AHRQ Quality Assessment Organizational Framework

Directness		Consistency		Study Limitations			Precision		Reporting Bias	
Direct	Indirect	Consistent	Inconsistent	Low	Medium	High	Precise	Imprecise	Suspected	Unsuspected

Following the completion of all data extraction, all relevant items were tabulated to identify trends in the data and generate tables for further review. This method allowed for the review across all identified studies to create a general consensus for the items commonly included in the pertinent existing literature.

4 RESULTS

4.1 GENERAL RESULTS

Table 4: Results Summary

General Study Information	SIEPS Framework								General Burnout Information	
	Person		Task		Environment		Organization	Technology		
Specialty	Mitigating	Contributing	Mitigating	Contributing	Mitigating	Contributing	Mitigating	Contributing	Burnout Tools Mentioned	Implications of Burnout
General	Time away from work	Financial stress	Continuing Education	Patient care	Supportive faculty/supervisors	Job Resources	Wellness Initiatives	EHR Time Commitment	MBI Unspecified	Increased errors
Plastic	Resilience	Work/life balance		Charting	Social support	Social support	Administrative policies that facilitate work-life integration	EHR General	MBI 22 Item	Suicidal ideation
Orthopaedic	Work/life balance	Depression		Continuing education	Support from mid-level clinicians or scribes	Workplace bullying	Perceived Organizational Support		MBI 9 Item	Substance Abuse
Otolarynology	Emotional Intelligence	Time away from work		Leadership roles	Job Resources	Supportive faculty/supervisors	Leadership		MBI-HSS MP	Depression
Vascular	Work Engagement	Self appraisal			Opportunities for professional development	Autonomy			Professional Fulfillment Index	Increased rates of attrition
Neurological	Self appraisal	Anxiety			Autonomy	Meaningful feedback			Single-Item Burnout Assessment	Decreased productivity
Urology	Psychiatric Treatment	Worrying about Childcare			Meaningful feedback				MBI-HSS MP 2 item	Decreased professionalism
OBGYN	Mindfulness	Concern about Covid 19							MBI-HSS	Job Satisfaction
	Job performance	Job Satisfaction							The Oldenburg Burnout Inventory (OBLI)	
	Grit	Appraisal of others							8-item Short Form Health Survey (SF-8)	
	Appraisal of others								Satisfaction With Medicine Scale	
									Linear Analogue Self-Assessment	

For the 15 studies included for data analysis, 13 studies were cross-sectional in design and 2 were cohort studies. All studies were published between 2006 and 2020. The sample size ranged from 53 participants to 7,409 participants. Participant sex and age was not frequently reported as statistically significant among the 15 included studies, so it was not included for further analysis. Additionally, most studies did not specify postgraduate year (PGY) status within participants to any significant value. However, most studies did provide information regarding the specialty associated to the specific resident population in question. The breakdown of specialties mentioned across the 15 studies is listed below. It should be noted that this review focused on general surgery residents, which is reflected in the table below. Other surgical residencies mentioned were noted for reference.

Table 5: Specialties Represented in Studies

SPECIALTY	# OF STUDIES REFERENCING SPECIALTY
GENERAL	14
PLASTIC	5
ORTHOPAEDIC	4
OTOLARYNOLOGY	4
VASCULAR	3
NEUROLOGICAL	3
UROLOGY	3
OBGYN	2
PEDIATRIC	2
COLORECTAL	1
OPTHALMIC	1

The SIEPS framework was utilized as a methodological approach to understand the relationships between burnout and human, task, environment, organization, and

technology. Results are presented by category (human, task, environment, organization, and technology) and each category is separated into factors that mitigate burnout and factors that contribute to burnout.

4.2 SIEPS Framework: Human

The two most frequently mentioned human focused factors mitigating burnout was time away from work and resilience. Time away from work was often categorized as time for individual self-care, personal interests and hobbies, and time spent with friends and family. Work/life balance was categorized separately to account for the fact that studies mentioning time away from work were not focused on the amount of time residents spent away from work, but merely the opportunity to engage in activities outside of work. Additionally, individual resilience was mentioned as a significant personal factor mitigating burnout, but opportunities and methods to improve or enhance one's resilience was not widely mentioned. Emotional intelligence and grit were referred to similarly.

Table 6: Human Factors Mitigating Burnout

FACTORS MITIGATING BURNOUT	# OF STUDIES MENTIONED	STUDIES REFERENCED
TIME AWAY FROM WORK	6	1,2,5,7,10,13
RESILIENCE	5	3,7,11,14,15
WORK/LIFE BALANCE	3	7,11,14
EMOTIONAL INTELLIGENCE	3	3,13,15
WORK ENGAGEMENT	1	3
SELF APPRAISAL	1	8
PSYCHIATRIC TREATMENT	1	5
MINDFULNESS	1	3
JOB PERFORMANCE	1	3
GRIT	1	12
APPRAISAL OF OTHERS	1	11

Financial stress was the most frequently mentioned personal factor contributing to burnout. The lack of work-life balance or lack of time away from work was also a contributing factor. Depression, which is commonly associated with burnout, was also referenced.

Table 7: Human Factors Contributing to Burnout

FACTORS CONTRIBUTING TO BURNOUT	# OF STUDIES MENTIONED	STUDIES REFERENCED
FINANCIAL STRESS	3	1,4,7
WORK/LIFE BALANCE	2	1,8
DEPRESSION	2	1,7
TIME AWAY FROM WORK	2	1,14
SELF APPRAISAL	1	7
ANXIETY	1	7
WORRYING ABOUT CHILDCARE	1	1
CONCERN ABOUT COVID 19	1	4
JOB SATISFACTION	1	7
APPRAISAL OF OTHERS	1	1

4.3 SIEPS Framework: Task

Only one task was mentioned in relation to mitigating burnout across the 15 studies. One study mentioned the opportunity to engage in continued didactic education as a method to build confidence and further their exposure and knowledge.

Table 7: Task Factors Mitigating Burnout

FACTORS MITIGATING BURNOUT	# OF STUDIES MENTIONED	STUDIES REFERENCED
CONTINUINING EDUCATION	2	4,11

Patient care and charting were factors contributing to burnout. Studies mentioning these two tasks stated that these tasks are in alignment with how residents spend the majority of their time at work.

Table 8: Task Factors Contributing to Burnout

FACTORS CONTRIBUTING TO BURNOUT	# OF STUDIES MENTIONED	STUDIES REFERENCED
PATIENT CARE	2	5,8
CHARTING	2	1,2
CONTINUING EDUCATION	1	11
LEADERSHIP ROLES	1	10

4.4 SIEPS Framework: Environment

Supportive faculty and supervisors were the most commonly mentioned environmental factor associated with mitigating burnout. Social support or peer-level support was the second most frequently mentioned factor mitigating burnout, with support from mid-level clinicians following closely behind.

Table 9: Environmental Factors Mitigating Burnout

FACTORS MITIGATING BURNOUT	# OF STUDIES MENTIONED	STUDIES REFERENCED
SUPPORTIVE FACULTY/SUPERVISORS	5	2,5,7,11,13
SOCIAL SUPPORT	3	1,5,15
SUPPORT FROM MID-LEVEL CLINICIANS OR SCRIBES	2	1,2
JOB RESOURCES	2	3,12
OPPORTUNITIES FOR PROFESSIONAL DEVELOPMENT	2	5,13
AUTONOMY	1	13
MEANINGFUL FEEDBACK	1	15

While adequate job resources were not the leading factor to mitigating burnout, the lack of adequate job resources was mentioned the most frequently as a contributing factor to burnout. The lack of social support was also mentioned as a factor contributing to burnout, which is in alignment with the environmental factors mentioned above to mitigate burnout.

Table 10: Environmental Factors Contributing to Burnout

FACTORS CONTRIBUTING TO BURNOUT	# OF STUDIES MENTIONED	STUDIES REFERENCED
JOB RESOURCES	3	1,14,15
SOCIAL SUPPORT	2	7,11
WORKPLACE BULLYING	1	15
SUPPORTIVE FACULTY/SUPERVISORS	1	1
AUTONOMY	1	13
MEANINGFUL FEEDBACK	1	1

4.5 SIEPS Framework: Organization

Wellness initiatives were commonly mentioned as a method to mitigate burnout among residents. The mentioned wellness initiatives were designed to specifically target burnout or to target factors beyond burnout in order to promote overall wellness. In alignment with the personal factors mitigating burnout, organizational policies that facilitate work-life balance/integration or facilitate time away from work were considered organizational factors mitigating burnout.

Table 11: Organizational Factors Mitigating Burnout

FACTORS MITIGATING BURNOUT	# OF STUDIES MENTIONED	STUDIES REFERENCED
WELLNESS INITIATIVES	4	2,5,13,15
ADMINISTRATIVE POLICIES THAT FACILITATE WORK-LIFE INTEGRATION	3	2,5,7
PERCEIVED ORGANIZATIONAL SUPPORT	2	2,11
LEADERSHIP	1	5

There were no reported organizational factors mentioned that were referenced in regard to contributing to burnout.

4.6 SIEPS Framework: Technology

Only 3 out of the 15 included studies mentioned any form of technology. The most frequently reported technological factor contributing to burnout was the time residents spent interacting with the Electronic Health Record (EHR) system. The only other factor mentioned in relation to contributing to burnout was the EHR system as a whole. The mention of EHRs as a contributing factor to burnout aligns with the fact that charting was mentioned as a task contributing to burnout in the section above.

Table 12: Technological Factors Contributing to Burnout

FACTORS CONTRIBUTING TO BURNOUT	# OF STUDIES MENTIONED	STUDIES REFERENCED
EHR TIME COMMITMENT	2	1,2
EHR GENERAL	1	1

4.7 Burnout Results

Only 11 out of 15 studies clearly defined burnout. The most common definition among those 11 studies included 3 components: emotional exhaustion, depersonalization and lack of personal accomplishment. Some studies also referenced cynicism and inefficiency as defining factors of burnout.

An array of burnout implications were mentioned across the 15 studies. The most commonly mentioned implication was in relation to patient care and was referred to as the prevalence of increased medical errors by general surgery residents experiencing burnout. Further, some general surgery residents experiencing burnout report individual implications such as suicidal ideation, substance abuse, depression and a decrease in job satisfaction. However, the relationship between suicidal ideation, substance abuse and depression and burnout are not clearly illustrated. This means that there is not a definitive causal or associative relationship providing a chronological timeline as to which event or outcome occurs first. While the exact temporal relationship remains unclear, there is a strong enough association between the occurrence of the events to warrant their prevention. Regardless of the sequence of events, mitigating burnout, suicidal ideation, depression, and substance abuse is a step forward in better supporting general surgery residents and the greater workforce.

The impact on the greater workforce is often categorized as an increased rate of attrition. This suggests that general surgeons are existing from their care positions as a result of burnout and the associated health outcomes. This is impactful to the workforce because

this means fewer practicing surgeons, fewer future educators and a decrease in the knowledge and experience of the overall workforce. Further, increased rates of attrition can have significant implications on access for patients. Patients may need to travel further for care or may have longer waiting times as a result in the increase in attrition.

In addition, healthcare settings also experience decreased productivity with the increase in burnout. As general surgery residents become disengaged and overwhelmed, their ability to provide attentive, quality patient care is compromised. This can lead to negative patient experiences as well as medical errors or decreased efficiency. With the intensive schedule that general surgery residents maintain, residents must be highly functioning, organized, and productive to maintain timeliness while meeting or exceeding care standards.

Table 13: Implications of Burnout Mentioned

IMPLICATIONS OF BURNOUT MENTIONED	# OF STUDIES MENTIONED	STUDIES REFERENCED
INCREASED ERRORS	6	1,2,3,11,13,16
SUICIDAL IDEATION	3	11,13,16
SUBSTANCE ABUSE	3	11,13,16
DEPRESSION	3	1,7,16
INCREASED RATES OF ATTRITION	3	2,3,16
DECREASED PRODUCTIVITY	2	3,7
DECREASED PROFESSIONALISM	2	1,2
JOB SATISFACTION	1	11

Several different tools were used to assess and measure burnout across the 15 studies. Across all tools, the prevalence of burnout ranged widely from 39% to 93%. The most common tool used was the Maslach Burnout Inventory (MBI) tools. There were at least 5

different variations of the MBI used and 4 additional studies used the MBI but did not specify which variation or version of the MBI was used.

Table 14: Burnout Tools Used

BURNOUT TOOLS USED	# OF STUDIES MENTIONED	STUDIES REFERENCED
MBI UNSPECIFIED	4	1,5,8,10
MBI 22 ITEM	2	13,15
MBI 9 ITEM	2	11,16
MBI-HSS MP	2	2,16
PROFESSIONAL FULFILLMENT INDEX	1	12
SINGLE-ITEM BURNOUT ASSESSMENT	1	12
MBI-HSS MP 2 ITEM	1	3
MBI-HSS	1	9
THE OLDENBURG BURNOUT INVENTORY (OBLI)	1	7
8-ITEM SHORT FORM HEALTH SURVEY (SF-8)	1	8
SATISFACTION WITH MEDICINE SCALE	1	8
LINEAR ANALOGUE SELF-ASSESSMENT	1	8

In addition to the tools listed above that were used to measure burnout, other tools were used within the 15 studies. These tools were used to measure depression, grit, emotional intelligence, exhaustion, mindfulness, perceived stress, and resilience in addition to several other factors. A list of all tools utilized can be found below. The most common additional tools were specifically curated for the specific study. These unique tools were commonly combinations of several tools all combined into a larger survey. However, not all studies mentioned the specific components of their uniquely curated assessment tools.

Table 15 Other Tools Mentioned

OTHER TOOLS MENTIONED	# OF STUDIES MENTIONED	STUDIES REFERENCED
CREATED UNIQUE SURVEY TOOL	6	4,5,11,12,13,14
JOB DEMANDS-RESOURCES SCALE	2	13,15
TRAIT EI QUESTIONNAIRE SHORT FORM	2	13,15
ABBREVIATED WORKPLACE CLIMATE QUESTIONNAIRE	1	11
ABSITE SCORE	1	9
BRIEF RESILIENCE SCALE	1	11
CENTER FOR EPIDEMIOLOGIC STUDIES DEPRESSION SCALE	1	10
CONNOR-DAVIDSON RESILIENCE SCALE 2 ITEM	1	3
DISRUPTIVE BEHAVIOR QUESTIONS	1	13
DUCKWORTH GRIT SCALE (DGS)	1	12
DUPUY PSYCHOLOGICAL GENERAL WELL-BEING	1	5
EMOTIONAL INTELLIGENCE SCALE - 10 ITEM	1	3
EPWORTH SLEEPINESS SCALE	1	10
HERZBERG MOTIVATIONAL DIMENSIONS	1	9
INSTITUTE ON ALCOHOL ABUSE AND ALCOHOLISM (NIAAA)	1	7
NEW GENERAL SELF-EFFICACY (NGSE) SCALE	1	7
OCCUPATIONAL FATIGUE EXHAUSTION/RECOVERY SCALE	1	12
PERCEIVED STRESS SCALE (PSS)	1	7
PHQ-2	1	2
PHQ-4	1	7
PHQ-9	1	1
REVISED COGNITIVE AND AFFECTIVE MINDFULNESS SCALE (CAMS-R) 10 ITEM	1	3
SF-12	1	10
SUPPORT SCALE (MOS-SSS)	1	7
UTRECHT WORK ENGAGEMENT (UWES-9)	1	3

4.8 AHRQ ASSESSMENT

Table 16: AHRQ Assessment Summary

Directness		Consistency		Study limitations			Precision		Reporting Bias	
Direct	Indirect	Consistent	Inconsistent	Low	Medium	High	Precise	Imprecise	Suspected	Unsuspected
15	0	15	0	10	5	0	15	0	0	15

This quality assessment highlights that no major concerns were discovered in the quality or integrity of the studies used in this review. Some studies were limited by COVID-19, sample size, participant recruitment method or minor aspects of the methodology. However, no study was deemed as having “high study limitations”. As a result, all studies were considered valid for this review.

5 Discussion

5.1 Interpretations of Results

One of the more impactful outcomes of this study is the lack of literature surrounding the interactions, experiences and implications of general surgery residents and technology. Only three of the included studies directly referenced technology as either a contributing or mitigating factor for burnout. One study identified that residents spend approximately 50.6% of their shift time using computers, compared to the 9.4% of their shifts spent interacting with patients (Mamykina, 2016). If residents are spending at least half of their time at work using technology, then it is reasonable to suggest a possible association between technology and burnout. However, the lack of investigation into the impact of technology on general surgery residents highlights a major percentage of their working time that has not been considered in direct relation to burnout in most studies focusing on burnout in general surgery residents.

This lack of investigation into the technological factors associated with burnout in general surgery residents has severely limited the impact of a sociotechnical approach. Technology is a vital component and one the four pillars of the sociotechnical framework (Image 1). Without the technological component, the framework is left with a sizeable gap and thus a deficit in the conclusions that can be drawn in alignment with the framework.

Despite the lack of focus on technology in relation to burnout in general surgery residents, there is a reasonable amount of information surrounding the other three components of the sociotechnical framework: people, structure, and tasks. Many of the factors studied in relation to burnout are focused on the personal factors that make an individual either more or less at risk of experiencing burnout throughout their careers. While certain individuals might be of higher risk of experiencing burnout, there remain individuals who would be considered “low risk” who experience burnout. This suggests that the factors contributing to and mitigating burnout extend well beyond personalized risk factors. For this reason, a sociotechnical framework provides a unique lens to study burnout because it considers the personal factors in combination with other known, impactful factors.

The structural and organization policies that directly affect residents are another focal point in the sociotechnical framework. There has recently been in an increase in attention towards the structural factors contributing to burnout in residents. For example, the Accreditation Council for Graduate Medical Education (ACGME) instituted a rule that residents are only able to work a maximum of 80-hour work week. This policy has directly impacted the structure of resident training programs to protect residents and improve resident overall wellness. Further, many institutions have created targeted wellness initiatives to improve the wellbeing of residents. Many of these wellness initiatives, help to address resident concern or areas where residents feel that they need more instruction, support, or flexibility.

The most frequently mentioned factor in this study contributing to or mitigating burnout is the opportunity for time away from work. The parameters instituted by the ACGME to limit the hours residents can work each week has likely helped to mitigate the intensity of burnout experienced by residents. However, residents are still spending a significant amount of time working within understudied environments.

The term “understudied environment” is used to account for the existing gaps in the literature relating to the tasks and technology. Because burnout is still prevalent even with these decreasing hours, this suggests that there needs to be investigative exploration into the tasks and environments that residents are exposed to daily. While there has been some exploration into the tasks related to burnout in general surgery residents, it remains less studied than the personal or structural factors. The gap in tasks contributing to burnout aligns with the lack of technology-focused literature in relation to burnout in general surgery residents. As mentioned above, residents spend over half of their workday interacting with technology. This is a significant amount of time spent doing various tasks that require technology. However, this gap in literature at the intersection of tasks and technology is highlighted in both areas individually and in the ability to draw overarching conclusions. It is possible that these large gaps could contain key insights into the ability to derive meaningful information from the socio-technical framework to better explain the factors, environments and experiences that occur within the workplace.

Two of the most common factors mentioned regarding the environment in which residents work were support from faculty, supervisors and peers and intentional wellness

initiatives. Both factors work in alignment to create a more positive environment for residents. While these factors do not necessarily mitigate the existing factors inducing burnout, they do support the residents alongside the factors contributing to burnout. Ultimately, it would be most beneficial to identify and reduce the factors contributing to burnout, while continuing to facilitate and enhance a positive and supportive environment. Continued research into better understanding the tasks and technology related to burnout in general surgery residents will allow researchers to effectively utilize the sociotechnical framework to offer a more encompassing and inclusive understanding of the factors contributing to and mitigating burnout in general surgery residents. With this enhanced information and perspective, administrators and educators can create targeted indicatives to mitigate the factors associated with burnout for general surgery residents.

The abundance of burnout tools present across the 15 identified studies suggests a need for standardization of tools used when measuring burnout. It is challenging to draw significant conclusions across studies using different tools. Comparing across these different tools could potentially be done by first finding commonalities in the tools used. A modified scale could be used to standardize reported burnout statistics. Using this newly designed scale to accommodate different tools, each study could be re-assessed using this new scale to draw general conclusions. While there would likely be some significant limitations with a methodology, it would be a starting point and would allow for conclusions across studies published prior to a standardized tool. However, moving

towards a more standardized tool will provide a more reliable consensus and more meaningful results.

Additionally, the number of unique tools used in addition to various burnout tools used only adds to the challenge of drawing parallels from the results. While the perceived need to create unique surveys tailored to the specific needs of the study is understood, it limits the replicability and generalizability of studies.

5.2 Limitations and Future Work

While this study reviewed over four-thousand studies, it only utilized four databases. Other databases should be explored to widen the scope of understanding of the entire breadth of existing literature in the subject area.

This study aimed to explore the socio-technical factors associated with burnout, however only three studies mentioned any form of technology. This gap in the prevalence of technology in the identified studies made it challenging to utilize the socio-technical framework to its fullest extent. More information regarding technology's association to burnout in general surgery residents is needed to draw significant conclusions. Moving forward, revisions in the key search terms could be impactful. Additionally, expanding the number of databases could provide a greater number of resources.

Despite general surgery residents consistently experiencing burnout higher than most other residency specialties, there is limited prior work exploring the combination of

factors contributing to or mitigating burnout in general surgery residents (Low, 2019). While there has been an improving presence of studies focused specifically on burnout in residents, more research is needed to better understand the interaction of factors contributing to burnout in general surgery residents. Exploring the relationship between a single factor and burnout is important, but a broader understanding of the experience is necessary to understand the full scope of factors contributing to burnout in general surgery residents. Many articles conclude that the specific factor being studied is associated with increased or decreased rates of burnout. However, studying the culmination of these factors will account for the coexistence and relationship of these factors in the general surgery resident environment.

The factors identified under each component of the SIEPS framework were based on human judgement. For future studies, it would be beneficial to utilize existing frameworks. Where there are no relevant existing frameworks, there is an additional opportunity for further research to construct a framework that can be utilized for future reviews.

6 Conclusion

In summation, the most frequently mentioned factor in this study contributing to or mitigating burnout is the opportunity for time away from work. The two most notable factors regarding the environment in which general surgery residents work were support from faculty, supervisors and peers and intentional wellness initiatives. While these factors do not necessarily mitigate the existing factors inducing burnout, they do support the resident and aim to create a more positive and healthy work environment. Unfortunately, only 3 out of the 15 identified studies mentioned any form of technology as a factor contributing to or mitigating burnout in general surgery residents. As a result of the limited presence of technology in the identified studies, the sociotechnical framework is left with a sizeable gap and thus a deficit in the conclusions that can be drawn in alignment a sociotechnical approach.

This systematic review demonstrates the need for continued exploration into the sociotechnical factors contributing towards and mitigating burnout in general surgery residents. While this study attempted to use a sociotechnical approach to understand the interaction between residents and technology, there was not enough existing research focused on the way in which residents interact and engage with technology and the respective implications in order to draw any significant conclusions. While it is known that residents spend over half of their workday interacting with technology, there exists a

major gap in literature at the intersection of tasks and technology in relation to burnout in general surgery residents. This gap results in an inability to draw overarching conclusions using the sociotechnical framework. In the future, more research is needed on the specific technological factors that contribute to or mitigate burnout in general surgery residents.

Further, this study highlights the need for standardized practice when studying burnout in residents. First, defining burnout is essential in order to effectively understand and interpret the results of studies. Without a clear definition, it is challenging to incorporate study findings into reviews such as this one. Next, it is imperative that studies utilize a standardized method for identifying and quantifying burnout. It is acceptable to include additional tools but ensuring the inclusion of at least one standardized tool will allow for better comparison of results across studies.

With the addition of future research into the sociotechnical factors contributing to and mitigating burnout, administrators and educators will be able to better support general surgery residents and facilitate healthier and more positive work environments. Advocating for the well-being of current and future general surgery residents will ensure a healthy workforce and improved quality of care for patients. This systematic review highlights the importance in investing and caring for those who spend their careers caring for others.

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8 APPENDICES

8.1 APPENDIX 1: SEARCH STRATEGY

- PubMed

  (surgeons[MeSH Terms] OR surgeon*[tiab] OR colorectal-surgery[MeSH Terms] OR colorectal-surgery[tiab] OR general-surgery[MeSH Terms] OR general-surgery[tiab] OR gynecology[MeSH Terms] OR gynecology[tiab] OR neurosurgery[MeSH Terms] OR neurosurgery[tiab] OR obstetrics[MeSH Terms] OR obstetrics[tiab] OR ophthalmology[MeSH Terms] OR ophthalmology[tiab] OR orthognathic-surgery[MeSH Terms] OR orthognathic-surgery[tiab] OR orthopedics[MeSH Terms] OR orthopedics[tiab] OR otolaryngology[MeSH Terms] OR otolaryngology[tiab] OR surgery,-plastic[MeSH Terms] OR plastic-surgery[tiab] OR surgical-oncology[MeSH Terms] OR surgical-oncology[tiab] OR thoracic-surgery[MeSH Terms] OR thoracic-surgery[tiab] OR traumatology[MeSH Terms] OR traumatology[tiab] OR urology[MeSH Terms] OR urology[tiab] OR surgical[tiab] OR specialities,-surgical[MeSH Terms] OR surgical-specialty[tiab]) AND (education,-medical,-graduate[MeSH Terms] OR internship-and-residency[MeSH Terms] OR internship[tiab] OR residency[tiab] OR resident-physician*[tiab] OR resident*[tiab] OR resident-doctor*[tiab] OR resident-medical-officer[tiab] OR intern[tiab] OR interns[tiab] OR fellow[tiab] OR fellows[tiab] OR trainee[tiab] OR foundation-year[tiab] OR registrar[tiab] OR physicians[MeSH Terms] OR physician*[tiab] OR doctor*[tiab] OR specialty-trainee[tiab]) AND (determinant*[tiab] OR factor*[tiab] OR driver*[tiab] OR caus*[tiab] OR contributor*[tiab] OR stressor*[tiab] OR predictor*[tiab] OR predispos*[tiab] OR correlat*[tiab] OR associat*[tiab] OR risk[MeSH Terms] OR risk*[tiab]) AND (burnout,-psychological[MeSH Terms] OR psychological-burnout[tiab] OR burnout,-professional[MeSH Terms] OR stress,-psychological[MeSH Terms] OR psychological-stress*[tiab] OR burnout[tiab] OR burn-out[tiab] OR burned-out[tiab] OR burnt-out[tiab] OR occupational-stress[MeSH Terms] OR occupational-stress*[tiab] OR job-stress*[tiab] OR work-related-stress*[tiab] OR workplace-stress*[tiab] OR work-place-stress*[tiab] OR professional-stress*[tiab] OR job-related-stress*[tiab] OR suicide[MeSH Terms] OR suicide[tiab] OR suicidal[tiab] OR depersonalization[MeSH Terms] OR depersonalization[tiab] OR emotional-exhaustion[tiab] OR mental-fatigue[MeSH Terms] OR mental-fatigue[tiab] OR compassion-fatigue[MeSH Terms] OR compassion-fatigue[tiab] OR depression[MeSH Terms] OR depression[tiab] OR depressive-symptom*[tiab] OR well-being[tiab] OR wellbeing[tiab] OR wellness[tiab] OR resiliency[tiab])

- Scopus and Web of Science

  (surgeon* OR colorectal-surgery OR general-surgery OR gynecology OR neurosurgery OR obstetrics OR ophthalmology OR orthognathic-surgery OR orthopedics OR otolaryngology OR plastic-surgery OR surgical-oncology OR thoracic-surgery OR traumatology OR urology OR surgical OR surgical-specialty) AND (internship OR residency OR resident-physician* OR resident* OR resident-doctor* OR resident-medical-officer OR intern OR interns OR fellow OR fellows OR trainee OR foundation-year OR registrar OR physician* OR doctor* OR specialty-trainee) AND (determinant* OR factor* OR driver* OR caus* OR contributor* OR stressor* OR predictor* OR predispos* OR correlat* OR associat* OR risk*) AND (psychological-burnout OR psychological-stress* OR burnout OR burn-out OR burned-out OR burnt-out OR occupational-stress* OR job-stress* OR work-related-stress* OR workplace-stress* OR work-place-stress* OR professional-stress* OR job-related-stress* OR suicide OR suicidal OR depersonalization OR emotional-exhaustion OR mental-fatigue OR compassion-fatigue OR depression OR depressive-symptom* OR well-being OR wellbeing OR wellness OR resiliency)

- Embase

  ('surgeon'/exp OR surgeon*:ti OR surgeon*:ab OR 'colorectal-surgery'/exp OR 'colorectal surgery':ti OR 'colorectal surgery':ab OR 'general-surgery'/exp OR 'general surgery':ti OR 'general surgery':ab OR 'gynecology'/exp OR gynecology:ti OR gynecology:ab OR 'neurosurgery'/exp OR neurosurgery:ti OR neurosurgery:ab OR 'obstetric' OR obstetric*:ti OR obstetric*:ab OR 'ophthalmology'/exp OR ophthalmology:ti OR ophthalmology:ab OR 'orthognathic-surgery'/exp OR 'orthognathic surgery':ti OR 'orthognathic surgery':ab OR 'orthopedics'/exp OR orthopedics:ti OR orthopedics:ab OR 'otorhinolaryngology'/exp OR otorhinolaryngology:ti OR otorhinolaryngology:ab OR otolaryngology:ti OR otolaryngology:ab OR 'plastic-surgery'/exp OR 'plastic surgery':ti OR 'plastic surgery':ab OR 'surgical-oncology'/exp OR 'surgical oncology':ti OR 'surgical oncology':ab OR 'thorax surgery'/exp OR 'thorax surgery':ti OR 'thorax surgery':ab OR 'thoracic surgery':ti OR 'thoracic surgery':ab OR 'traumatology'/exp OR traumatology:ti OR traumatology:ab OR 'urology'/exp OR urology:ti OR urology:ab OR surgical:ti OR surgical:ab OR 'surgical specialt*':ti OR 'surgical specialt*':ab)

  AND

  ('medical education'/exp OR 'medical education':ti OR 'medical education':ab OR 'graduate medical education':ti OR 'graduate medical education':ab OR internship:ti OR internship:ab OR residency:ti OR residency:ab OR 'resident'/exp OR resident:ti OR resident:ab OR intern?:ti OR intern?:ab OR fellow?:ti OR fellow?:ab OR 'student'/exp OR student:ti OR student:ab OR trainee:ti OR trainee:ab OR 'foundation year':ti OR 'foundation year':ab OR registrar:ti OR registrar:ab OR 'physician'/exp OR physician?:ti OR physician?:ab OR doctor?:ti OR doctor?:ab OR 'specialty trainee':ti OR 'specialty trainee':ab)

  AND

  (determinant?:ti OR determinant?:ab OR factor?:ti OR factor?:ab OR driver:ti OR driver:ab OR caus*:ti OR caus*:ab OR contributor?:ti OR contributor?:ab OR stressor?:ti OR

stressor?:ab OR predictor?:ti OR predictor?:ab OR predispos*:ti OR predispos*:ab OR correlat* OR correlat*:ti OR correlat*:ab OR associat* OR associat*:ti OR associat*:ab OR 'risk'/exp OR risk:ti OR risk:ab)

AND

('psychological burnout':ti OR 'psychological burnout':ab OR 'burnout'/exp OR burnout:ti OR burnout:ab OR 'mental stress'/exp OR 'mental stress':ti OR 'mental stress':ab OR 'burned out':ti OR 'burned out':ab OR 'burnt out':ti OR 'burnt out':ab OR 'job stress'/exp OR 'job stress*':ti OR 'job stress*':ab OR 'occupational stress*':ti OR 'occupational stress*':ab OR 'work related stress*':ti OR 'work related stress*':ab OR 'workplace stress*':ti OR 'workplace stress*':ab OR 'work place stress*':ti OR 'work place stress*':ab OR 'professional stress*':ti OR 'professional stress*':ab OR 'job related stress*':ti OR 'job related stress*':ab OR 'suicide'/exp OR suicide:ti OR suicide:ab OR suicidal:ti OR suicidal:ab OR 'depersonalization'/exp OR depersonalization:ti OR depersonalization:ab OR 'emotional exhaustion':ti OR 'emotional exhaustion':ab OR 'emotional stress'/exp OR 'emotional stress':ti OR 'emotional stress':ab OR 'mental fatigue':ti OR 'mental fatigue':ab OR 'dysthymia'/exp OR dysthymia:ti OR dysthymia:ab OR 'compassion fatigue'/exp OR 'compassion fatigue':ti OR 'compassion fatigue':ab OR 'depression'/exp OR depression:ti OR depression:ab OR 'depressive symptom*':ti OR 'depressive symptom*':ab OR 'well being':ti OR 'well being':ab OR 'wellbeing'/exp OR wellbeing:ti OR wellbeing:ab OR resiliency:ti OR resiliency:ab OR wellness:ti OR wellness:ab)

8.2 Appendix 2: Article Identification

Article Number	Article Title	Author(s)
1	Taking Care of Our Own: A Multispecialty Study of Resident and Program Director Perspectives on Contributors to Burnout and Potential Interventions	Emily G. Holmes1 & AnnaMarie Connolly1 & Karen T. Putnam1 & Kenan M. Penaskovic1 & Clark R. Denniston1 & Leslie H. Clark1 & David R. Rubinow1 & Samantha Meltzer-Brody1
2	The impact of program-driven wellness initiatives on burnout and depression among surgical trainees	Anthony H. Bui a, Jonathan A. Ripp a, Kyu Young Oh a, Frank Basloe a, Dahlia Hassan a, Saadia Akhtar a, I. Michael Leitman a, b, *
3	Do Internal or External Characteristics More Reliably Predict Burnout in Resident Physicians: A Multi-	C. Haddon Mullins, MD,* Frank Gleason, MD,† Tara Wood, MSPH,† Samantha J. Baker, MD, MEHP,† Alexander R. Cortez, MD,‡ Brendan Lovasik, MD,x Gurjit Sandhu, PhD,{ Amanda Cooper, MD,k

	institutional Study	Amy N. Hildreth, MD,# Jon D. Simmons,MD,** Keith A. Delman, MD,x, and Brenessa LindemanMD, MEHP
4	Effect of COVID-19 on Surgical Training Across the United States: A National Survey of General Surgery Residents	Hassan Aziz, MD, Tayler James, MD, Daphne Remulla, MS, Linda Sher, MD, Yuri Genyk, MD, Maura E. Sullivan, PhD, and Mohd Raashid Sheikh, MD
5	Perceived Value of a Program to Promote Surgical Resident Well-being	Arghavan Salles, MD, PhD,* Cara A. Liebert, MD,* Micaela Esquivel, MD,* Ralph S. Greco, MD, FACS,* Rebecca Henry, PhD,† and Claudia Mueller, PhD, MD*
7	Burnout and its relationship with perceived stress, self- ef!cacy, depression, social support, and programmatic factors in general surgery residents	Matthew R. Smeds a, *, Matthew R. Janko b, Steven Allen c, Kwame Amankwah d, Tracey Arnell e, Parswa Ansari f, Marcus Balters g, Donald Hess h, Elizabeth Ferguson i, Patrick Jackson j, Mary K. Kimbrough k, David Knight l, Melissa Johnson m, Michael Porter n, Brian D. Shames o, Rebecca Schroll p, Julia Shelton q, Jeffrey Sussman r, Peter Yoo
8	Effects of Duty Hour Restrictions on Core Competencies, Education, Quality of Life, and Burnout Among General Surgery Interns	Ryan M. Antiel, MD, MA; Darcy A. Reed, MD, MPH; Kyle J. Van Arendonk, MD; Sean C. Wightman, MD; Daniel E. Hall, MD, MDiv, MHSc; John R. Porterfield, MD, MPH; Karen D. Horvath, MD; Kyla P. Terhune, MD; John L. Tarpley, MD; David R. Farley, MD
9	The Impact of the 80-Hour Resident Workweek on Surgical Residents and Attending Surgeons	Matthew M. Hutter, MD, MPH,*† Katherine C. Kellogg, PhD,‡ Charles M. Ferguson, MD,* William M. Abbott, MD,*† and Andrew L. Warshaw, MD*†
10	Multifaceted Longitudinal Study of Surgical Resident Education, Quality of Life, and	Brenessa M. Lindeman, MD, Bethany C. Sacks, MD, Kenzo Hirose, MD, and Pamela A. Lipsett, MD

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11	Improving resident well-being and clinical learning environment through academic initiatives	Nathaniel Lee, MD,a,* Nital Appelbaum, PhD,b Michael Amendola, MD,a Kelley Dodson, MD,c and Brian Kaplan, Mda
12	Application of Advanced Bioinformatics to Understand and Predict Burnout Among Surgical Trainees	Vadim Kurbatov, MD, MHS, Matthew Shaughnessy, MD, Vanessa Baratta, MD, Danielle R. Heller, MD, Mollie Freedman-Weiss, MD, Benjamin J. Resio, MD, Matt Fleming, MD, and Peter S. Yoo, MD
13	Emotional Intelligence and Burnout in Surgical Residents: A 5-Year Study	Frank Gleason, MD, Samantha J Baker, MD, MEHP, Tara Wood, MSPH, Lauren Wood, MSPH, Robert H Hollis, MD, MSPH, Daniel I Chu, MD and Brenessa Lindeman, MD, MEHP
14	Reported burnout among U.S. general surgery residents: A survey of the association of program directors in surgery members	Kyle Kinslow a, Mason Sutherland a, Mark McKenney a,b, Adel Elkbuli
15	The Job Demands-Resources Model as a Framework to Identify Factors Associated With Burnout in Surgical Residents	Frank Gleason, MD, Emily Malone, MPH, Lauren Wood, MPH, Samantha J. Baker, MD, MEHP, Robert H. Hollis, MD, MSPH, Joshua S. Richman, MD, PhD, Daniel I. Chu, MD, and Brenessa Lindeman, MD, MEHP*
16	Discrimination, Abuse, Harassment, and Burnout in Surgical Residency Training	Yue-Yung Hu, M.D., M.P.H., Ryan J. Ellis, M.D., M.S.C.I., D. Brock Hewitt, M.D., M.P.H., Anthony D. Yang, M.D., Elaine Ooi Cheung, Ph.D., Judith T. Moskowitz, Ph.D., M.P.H., John R. Potts III, M.D., Jo Buyske, M.D., David B. Hoyt, M.D., Thomas J. Nasca, M.D., and Karl Y. Bilimoria, M.D., M.S.C.I.